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Spray head

The subject of the present invention is a spray head, especially for a high-pressure spray gun, comprising a rotary element, which is placed within a central body and through which passes a duct having a spray orifice, and a seal ensuring leak-tightness between the rotary element and the gun.

Patent Application PCT/CH97/00316 has a spray head for a high-pressure spray gun, comprising an element of cylindrical shape, which is mounted rotatably in a central body and through which passes a main conduit, at the end of which is mounted a spray nozzle delivering a tapered high-pressure fluid jet, two low-pressure air ducts being prolonged from the central body within the element of cylindrical shape on either side of the central conduit of the nozzle, the air-jet outlet orifices in the element of cylindrical shape being offset in relation to the inlet orifices in communication with the ducts of the central body.

Patent Application PCT/CH98/00104 has a spray head for a high-pressure spray gun, comprising a rotary element, which is placed in a central body and through which passes a duct having a spray orifice, and a seal ensuring leak-tightness between the rotary element and the gun, the rotary element having, in its central part, a spherical shape capable of cooperating with the seal placed within the central body, and two circular seats placed on either side of the spherical part bearing on the seats placed on either side of the central body.

The disadvantage of the spray heads known in the prior art is that the slit of the nozzle is at a level substantially equal to or lower than the top of the spray head, thus always resulting in interferences at the outlet of the fluid jet. Moreover, at the moment

when work is stopped, the liquid which has been unable to leave the gun falls down around the nozzle, and the user is therefore always faced with the need to clean it in order to prevent dry paint from accumulating around the slit of the nozzle and on the top of the spray head. The problem becomes even more acute when spray heads with additional air jets are used, since the air jets cause turbulence giving rise to fluid sedimentation deposits on the top of the head. These deposits are particularly troublesome, since they give rise to droplets which may be thrown on to the articles to be treated by the air jets.

The object of the present invention is to overcome these disadvantages and to propose a spray head, especially for a high-pressure spray gun, comprising a rotary element, which is placed in a central body and through which passes a spray nozzle, and a seal ensuring leak-tightness between the rotary element and the gun, characterized in that the rotary element has a circular central part comprising the nozzle and introduced into a lateral aperture of the central body, the circular central part being brought, by means of an upward translational movement of the central body, into a working position against at least one inner abutment located at the top of the central body, the nozzle placed in the circular part of the rotary element being in the working position above the top of the central body.

With the possibility of bringing the circular central part towards the top of the head by means of a translational movement, the nozzle placed on the central part can be raised and emerge from the top of the head. This will limit the accumulation of paint on the appliance during use and also the residual deposits of the fluid which are liable to cause smearing of the articles to be sprayed or to be covered.

By means of the arrangement proposed according to the current invention, the nozzle can be induced to exceed the height of the top of the head by a distance of 1 to 5 mm.

According to a preferred embodiment, the central part of the rotary element has at least one lateral shoulder taking the form of a spindle which cooperates with a groove-shaped prolongation of the lateral aperture of the central body, the groove of the central body making it possible, after the rotary element is introduced into the central body, to displace the rotary element towards the top of the central body, until the shoulder comes to bear against the inner abutment of the top of the central body.

According to this same embodiment, the central part of the rotary element has a second shoulder of the central part, said second shoulder being opposite the first and likewise taking the form of a spindle, the second shoulder cooperating with a groove made on the other side of the central body. The seal ensuring leak-tightness between the central body and the gun slides in a bore made in the spindle and at the base of the central body, so as to come to bear against the circular central part of the rotary element.

Still according to this embodiment, the circular central part of the rotary element takes the form of a ball which cooperates with the seal within the central body.

In this case, the seal may advantageously have an indentation such that the ball-shaped central part of the rotary element rests on the two edges of the indentation.

In another embodiment, the circular central part of the rotary element takes the form of a cylinder which cooperates with the seal within the central body.

The central body advantageously has passing through it a series of ducts allowing a low-pressure air stream for setting the opening angle of the fluid taper emerging through the nozzle, the ducts being located on one side of the nozzle and on the other and forming at their outlet an acute angle to the central conduit of the nozzle.

The central body has two diametrically opposed stubs in its upper part, the central body having passing through it two complementary ducts which are prolonged within said stubs, with outlet orifices directing a low-pressure air stream substantially perpendicularly to the slit of the nozzle, against the pressurized fluid taper emerging from the nozzle, thus causing the atomization of said fluid taper.

The rotary element has a pin which butts against two rims in the central body so as to be positioned in two ways which correspond to the working configuration and the cleaning configuration of the nozzle. The rotary element is connected to a handle which makes it possible to rotate through 180° between the two respective working and cleaning positions. According to the preferred embodiment, the rotary element is made from steel, stainless steel or chrome steel which in all cases has undergone thermal treatment for hardening its surface; the nozzle is manufactured from hard metal, for example from tungsten carbide; the central body is made from anodized aluminium, from steel or from a synthetic material reinforced with carbon fibre, and the cylindrical seal is made from ferrous or non-ferrous metal or from reinforced composite material.

The drawing illustrates a spray head according to the invention by way of example.

In the drawing, Figure 1 shows a view of a spray head of one embodiment of the head, partially in section, together with all its component elements,

Figure 2 shows a top view of a rotary element of the head,

Figure 3 shows a side view of the rotary element of Figure 2, with a section through its central part,

Figure 4 shows a side view of the central body,

Figure 5 shows a section through the central body of Figure 1,

Figure 6 shows a top view of the central body with a spray nozzle within it,

Figure 7 shows a section through a detail of the central body along the line VII-VII of Figure 6,

Figure 8 is a top view of a variant of the head illustrated in Figures 1 to 7,

Figure 9 is a sectional view along the line IX-IX of Figure 8,

Figure 10 is a sectional view along the line X-X of Figure 8, and

Figure 11 is a sectional view along the line XI-XI of Figure 8.

The spray head 1 illustrated in the drawing comprises a central body 2 through which a rotary element 3 passes. A cylindrical seal 4 is introduced into an axial bore

4a made in the central body, so as to be capable of sliding freely in said bore. The lower end of the seal 4 has a recess 5a, into which is positioned an end seal 5 which has a central aperture 7a issuing onto a central bore 7 made in the cylindrical seal 4. The seal 4 has at its base a circular outer groove 6a, in which is placed an O-ring seal 6 intended for ensuring leak-tightness between the cylindrical seal 4 and the bore 4a of the central body 2. The central bore 7 of the seal 4 widens in the form of a funnel 8 in its upper part, so as to come to bear against the rotary element 3, as explained below.

The rotary element 3 comprises a central part 31 taking the form of a ball and two shoulders 32, 32a, taking the form of a spindle (see also Figure 3). The shoulders 32 and 32a have at their free end a truncated disc 33 and a disc 35 respectively. The truncated disc 33 comprises a pin 34, cooperating with a recess 34a made in the central body 2 and serving as an abutment. A rod 36 extends outwards from the disc 33, prolongs the shoulder 32 along the same axis and receives at its free end a handle 36a fastened by means of a pin 36b. Alternatively, the handle 36a may be integrally moulded from reinforced synthetic material.

The cylindrical seal 4 has on its inner surface a V-shaped indentation 41 in contact with the rotary element 3 which rests on the two edges of the indentation 41. This indentation may take the form, in section, of a V or of a U. Alternatively, it may be replaced by a circular seal 41a which will preferably be made from metal or from composite material.

Within the central part 31 (Figure 3) of the rotary element 3 is located a tungsten carbide spray insert or nozzle 37 and a hollow screw 39 which grips the insert 37 by means of an O-ring seal 38 which is placed between the nozzle and the screw which has a central

bore, not shown, and is tightened with the aid of a hexagon-head spanner. The slit of the insert 37 is placed in the direction of the axis of the rotary element 3.

The central body 2 (Figures 4 and 5) has a lateral aperture 21 which is prolonged upwards by a groove 22, a second lateral aperture 21a of smaller dimension being located on the opposite side to the first and likewise being prolonged by a groove, as in the case of the lateral aperture 21. Two stubs 23 are placed at the top of the central body, each having an outlet orifice 25 in the direction of the axis of the central body and substantially perpendicular to the latter. These orifices 25 are in communication with two ducts 24 which pass through the wall of the central body in the direction of its axis and which are substantially perpendicular to the outlet orifices 25. These ducts 24 are intended for delivering an air stream towards the top of the spray insert 37 at the base of the jet. Their outlet orifices 25 may be replaced by slits. Further ducts 28 pass through the walls of the central body 2 in the direction of its axis so as to have access to the respective outlet orifices 29 (Figures 6 and 7) which are placed at the top of the central body and form an acute angle to the taper which emerges through the slit of the nozzle. These four orifices 29 are intended for delivering an air stream which makes it possible to change the spray angle. Within each of these ducts 28, and at their base, is provided a thread 28a which makes it possible to introduce, by means of a hexagon-head spanner, screws 28b which are used as air throttles. They take the form of hollow screws with different bore diameters for the purpose of varying the air flow. All the screws 28b of the same set have the same bore diameter. It is clear that the ducts 24 may likewise be provided with the hollow screws 28b serving for setting the air flow.

In the lower part the central body 2 has a groove in the form of a circular ring 27 cooperating for connection to the gun and allowing the low-pressure air to pass to the ducts 24, 28. In general, the guns used in conjunction with the spraying nozzle just described have one setting of compressed air which will be fed into the annular groove 27. The setting of the compressed air flow through the orifices 25 and 28 will be determined by the choice of the bores for the hollow screws 28b. There are on the market gun models with two different air settings. In this case, it will be possible to feed separately the ducts 24 and the orifices 25 issuing onto the stubs and the other ducts 28 and their respective orifices 29.

During operation, the rotary element 3 is introduced into the central body 2 through the aperture 21, and the truncated disc 33 having a diameter greater than the aperture 21 fixes the position up to which the rotary element 3 can be introduced. The disc 35 will emerge on the other side of the central body 2 through the aperture 21a. At this moment, the shoulders 32, 32a can slide over the entire length of the grooves 22 towards the top of the central body 2, until said shoulders 32 strike the upper part of the notches 22. The rotary element 3 is then located at the top of the central body 2 and the spray nozzle 37 is above said top. The seal 4 slides within the bore 30 of the central body 2 so as to ensure leak-tightness between the latter and the gun which is not illustrated in the drawing. The indentation 41 of the cylindrical seal 4 ensures greater leak-tightness, since the central part 31 of the rotary element 3, said central part being ball-shaped in the drawing, rests on the two edges of the indentation 41. In order to ensure this leak-tightness more effectively, the cylindrical seal 4 has at its base the end seal 5 made from polyamide plastic (nylon), which connects the head 1 to the gun, and the

O-ring seal 6 made from Viton, which cooperates with the central body 2 within its bore 30.

When the spray head 1 is in its working position, as shown in Figure 1, the high-pressure fluid arrives by way of the bores 7a, 7 and continues its path through the screw 39 and the nozzle 37 which are connected by means of the O-ring seal 38 made of Teflon. The fluid, which will emerge in the form of a taper through the spray nozzle 37, can be set by the addition of the low-pressure air by means of the two series of ducts (24, 28) which extend in the direction of the axis of the central body and within its walls. The pressurized air passes through the two ducts 24 coming from the groove 27 at the base of the central body 2 and arrives at the outlet orifices 25 which form a substantially right angle to the ducts, the low-pressure air being thrown substantially perpendicularly against the high-pressure fluid taper which emerges through the slit of the nozzle 37, thus reinforcing the atomization of said fluid taper by this supply of air. The low-pressure air likewise arrives at the ducts 28 which also extend from the base of the central body 2 and travels within the walls of said central body 2 in order to arrive at the orifices 29 which have an inclination in relation to the ducts 28. The low-pressure air passes through the ducts 28 and emerges on one side of the nozzle 37 and on the other, at the same time forming an acute angle to the central conduit of the nozzle 37, so as to make it possible to set the opening angle of the fluid taper which emerges through the nozzle 37.

With the aid of the handle 35, the rotary element can rotate through 180°, and the nozzle 37 is then placed in such a way that its slit confronts the outlet of the bore 7 and is ready to be cleaned. This operation is very simple, since the pin 34 butts against the rims 26 of the recess 34a in the two opposite positions, in each case placing the rotary element 3 accurately.

The variant of the head illustrated in Figures 8 to 11 comprises a central body 2, through which passes a rotary element or key, not illustrated, which is identical to the element 3 of the embodiment of Figures 1 to 7 and is provided with a seal, likewise not illustrated, which is identical to the seal 4 of Figures 1 to 7. In Figures 8 to 11, only the central body 2 has been illustrated, on the understanding that all the elements forming the central body and all the elements forming the head 2 and participating in the operation of the latter are the same as those in the embodiment of Figures 1 to 7.

The head 2 of Figures 8 to 11 therefore again has the lateral aperture 21 which is prolonged upwards by a groove 22 allowing the rotary element or key 3 to be introduced into the head 2 and brought into the working position by means of an upward translational movement in the groove 22, as illustrated in Figure 11. The two stubs 23 placed at the top of the head 2 likewise have the outlet orifice 50 which, in the variant, takes the form of a slit directing the additional atomizing air at an angle of approximately 12° in relation to the axis of the head. This angle of 12° may, of course, vary within a range from 0 to 20°, if action is to be taken on the jet at the outlet of the nozzle or a little higher. This angle will also depend on the height between the top of the nozzle and the top of the head, said height being in the range of 1 to 5 mm.

As in the embodiment of Figures 1 to 7, the atomizing orifices 50 are fed by the ducts 24 identical to those of the embodiment of Figures 1 to 7.

Still as in the embodiment of Figures 1 to 7, the ducts 28 (Figures 8 and 11) are connected to the outlet orifices 29 issuing at the top of the head 2. In the variant illustrated, there are two outlet orifices 29;

they may, however, be more numerous, for example 4 or 6. As in the embodiment of Figures 1 to 7, these outlet orifices 29 are intended for the additional air opening the sheaf of the main jet to a greater or lesser extent. If there are 4 of them, they will issue on either side of the axis XI-XI of the section of Figure 11. If there are 6 ducts, they will be placed on either side of the ducts 28 of Figure 8. As illustrated in Figure 11, the outlet orifices 29 form an angle to the vertical axis of the head which varies within a range of 45 to 60°. In the variant of Figure 11, the angle is 50°.

Finally, in the variant of Figures 8 to 11, the rotary element or key 3 is introduced into lateral apertures 21 of the head 2 which form an axis of 45° (axis IX-IX of the section of Figure 9) in relation to the two stubs 23 (line X-X of Figure 8). Thus, the nozzle 51 (Figure 8) will be placed at 45° in relation to the axis of the rotary element or key 3. This arrangement is advantageous because it allows an easier distribution of the additional air ducts and consequently a simpler manufacture of the head.

The embodiment of Figures 1 to 7, and also the variant of Figures 8 to 11, comprises a rotary element taking the form of a ball partially introduced into a funnel-shaped part located within the seal 4. As mentioned above, an indentation 41 is placed on the periphery of the funnel at the location where the spherical surface of the ball 31 is in contact with the interior of the seal. This indentation 41 may be produced by machining or moulding or by chasing the material of said seal. Alternatively, the indentation 41 may be replaced by a covering taking the form of a circular zone 41a inlaid within the cone, the zone 41a being in contact with the ball of the rotary element.

Although the embodiment and the variant which have just been described both have a rotary element or key 3 comprising a ball 31 placed between the two spindles 32 and 32a, it is clear that the invention is not limited to this solution and that the ball may be replaced by a cylinder or a concave circular surface. The seal 4 will then be matched to this surface by any means known to a person skilled in the art.

A central body 2 is produced from anodized aluminium; it may, however, by manufactured from stainless steel, from chrome steel or from plastic reinforced, for example, with carbon fibres.

The rotary element 3 and the seal 4 may likewise be produced from metal, from reinforced plastic or from ceramic.